Author's response to reviews

Title: The 10 largest public and philanthropic funders of health research in the world: what they fund and how they decide

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Version: 2
Date: 24 November 2015

Author's response to reviews: see over
20 November 2015

Dear editor,

Thank you for the opportunity to submit a revised version of this paper. The analysis presented in this article and the website www.healthresearchfunders.org, in our view, address an important gap in our knowledge of the health research funding landscape globally. We were glad to see that although the reviewers asked for major revisions, they were also quite positive in terms of the contributions of our work. We are happy to have had the opportunity to improve this manuscript based on their comments.

Here below, we describe how we addressed the comments by the reviewers point by point.

Reviewer: Michael Head

Reviewer’s report:

I have recommended that major revisions be made before this paper can be accepted. It is an interesting piece of work, that has collated some novel hard-to-assemble data, and for that the authors should be congratulated. This is also an appropriate journal. However, I do not think the quality of writing is good enough to warrant publication at this stage, and the authors should be encouraged to rewrite the paper and resubmit it.

Major compulsory revisions

1. This piece of work has some clearly interesting and novel results, and has no doubt been complex to put together. However, my main issue overall is that the complexity of the work spills into the paper, which is hard to read. There is a skill in writing concisely and clearly, yet conveying sufficient information to allow the reader to understand what has happened, and in my view, the authors have not achieved this here.

The methods section is long, and frequently repeats pieces of information or presents work in two paragraphs that could easily be combined. Of particular importance is that the reader’s interest in the results section is diminished due to the presence of further blocks of text that should really be in the methods. There is very little of the actual results in the results section.

So, I would suggest for this point that the methods and results be completely rewritten, with a new concise methods section, and a results section containing more explanation surrounding some of the very interesting tables of data that are in this study. Make more and better use of the option to put extra detail in supplementary information document (and once these two sections are written, update the abstract to reflect this too; again there is little actual result presented there, the most interesting bit of the study, but instead methodology is in the abstract results section). Maybe make more use of flowcharts, images or tables to explain the processes involved in collecting data.

Answer: thank you for this suggestion. In hindsight we agree that we had gone a bit overboard in our description of the methods (with good intentions – to allow for our analysis to be repeated by others). We have rewritten the Methods section as suggested and have provided more detail on the methods in a supplementary information document, as suggested. With regards to the Results, we have
moved parts of this section to the Methods as suggested. We have also expanded our descriptions of the data in the Results, both in the main text and in the Abstract.

Minor Essential Revisions.

1. Methods, section entitled ‘Assessing health research expenditures’

I’d like clarity on the impact of the different type of institutional expenditure data e.g. expenditure including operational costs, data excluding operational costs, and total turnover in a fiscal year.

Presumably some institutions reported all of these numbers, so to what extent were the numbers in each category different?

If they were greatly different, then how confident are you that you can compare different funders using very different numbers? I think it’s important to clarify and report on this, perhaps by a small sensitivity analysis where you have the data available. It would increase confidence in the results, and increase transparency in an understandable limitation.

Answer: Unfortunately, the data available / published by funders is very limited, this has been an ongoing challenge for us in this study. This is why we described these challenges in such detail in our paper. Almost all funders reported only one of these categories. What we have done to address the reviewer’s point is that we have added a sentence to our Methods Appendix (section “Assessing health research expenditures”) noting this, in case others have a similar question. Also, in terms of comparability of the data, we note that the data from the funders in the top-10, who are the most important in our report and on who we collected the most data, are very similar; all relate only to health research, all concern actual expenditures or commitments, and all except one exclude operational costs. Therefore, it is not possible that there are any organizations in the top-10 because of overestimations. We now note this in the main text of our article (and in the Methods Appendix).

Discretionary Revisions.

1. References in abstract and through the paper about how this study set out to achieve a ‘simple target’. Would suggest removing, it does the authors a disservice and gives slightly the wrong impression, since this sort of work is anything but simple.

Answer: haha we can only agree; the reason we formulated it like this is because we wanted to highlight the discrepancy between an apparently simple question (who are the 10 largest funders of health research and what do they fund?) and the complexity involved in arriving at an answer, because data are often not available (and when they are, they are not well-comparable). We have taken it out the Abstract, but have left it in the main text, because we still rather like this formulation, we hope that’s acceptable.

2. Methods, abstract. ‘A search strategy was developed for identifying the world’s key funding organizations of health, The annual health research expenditures of each organization that was identified were collected...’

Suggest clarifying the search strategy, e.g. ‘the published and grey literature and policy reports were searched to identify the world’s key funding organisations and ranked by their reported total health expenditure from one financial year...’ or something like that.
Also, in the methods/supplementary, this could be more clearly and systematically described.

**Answer:** thanks for this suggestion. We now expand on this section in the methods appendix, which we agree we should have done in the first place. We have also amended the abstract to provide more detail.

3. Abstract, results. ‘37.1 billion US dollar, approximately 40%’. Specify the percentage rather than an approximation.

**Answer:** we have taken this out of the abstract, but still list it in the article itself as an approximation. We feel this is important because the denominator (the total of public and philanthropic expenditures on health R&D globally, as reported by John-Arne Rottingen and colleagues) is explicitly an approximation. To do any calculus on the basis of an approximation and to report it as exact, in our view, would not be appropriate.

4. Throughout inc abstract. Mention US dollars as the currency used somewhere in methods, then use the dollar sign rather than ‘US dollars’ in words.

**Answer:** corrected

5. Abstract, results. Remove the last sentence, since this is limitations, not a result. Add in more detail of results, e.g. who was the top funder (or top two or three funders), which health areas received most funding etc. Lots of your interesting data you could highlight here!

**Answer:** we moved the last sentence to the Methods and have added a lot more interesting data. Thank you for this suggestion, it has improved the abstract a lot!

6. Background, ‘These organizations play a central role in the development of new knowledge and products, particularly in areas that are not profitable[2] (as made clear, for example, by increased public sector involvement in the development of new antibiotics in recent years [3, 4]).’

Suggest i) revise to ‘areas that are considered not sufficiently profitable’ (as some areas of antibiotics have always been making money; ii) delete ‘as made clear’; iii) historically, public and philanthropic research funders have not been sufficiently addressing antimicrobial resistance or the development of new antibiotics (see e.g. Head et al, Journal of Antimicrobial Chemotherapy, doi:10.1093/jac/dkt349). So not quite sure the analogy of them plugging the gap in antibiotic development etc works!

**Answer:** we fully agree that antibiotic resistance has been a long neglected area by the public and philanthropic sector – and did not mean to suggest otherwise. We have changed this section to better reflect that this is a new development:

“These organizations play a central role in the development of new knowledge and products, particularly in areas that are not sufficiently profitable, such as in the development of medical products to combat neglected diseases and – only since recently – in the increased public sector involvement in the development of new antibiotics.”

We also added the suggested reference.
7. Methods, ‘2) we reviewed the major national funders of health research in the G20 countries, in the 20 countries with the highest overall spending on health research, and in the 20 countries with the highest public spending on health research’

List these countries in supplementary information (I presume most of the countries e.g. with the highest public spending on health research, will be in the G20, but useful to clarify with a simple table somewhere)

Answer: OK these are now added in the supplementary.

8. Methods, ‘We limited the amount of public funders that we included per country to two, to limit the scope of our study. The second largest public funder for each country was only included if it funded research for more than 200 million USD annually, or if it was significant in size as compared to other funding organizations in the country or to our compiled list of the largest funders in the world.’

Re the top 2 per country. Presumably the US and maybe other countries might have thus had a potential top public/charity funder excluded. I think it’s fine to justify this with the desire to have wider geographical representation (although if it’s merely one US funder who would otherwise have been included, then why not simply include and not worry about a top-two rule?). Also, why a $200 million dollar limit.

Need to clarify, in methods-supplementary.

Answer: This approach was chosen largely for reasons of feasibility. We needed to draw a line in terms of the number of public funders that we could include, otherwise our data collection would have had too wide a scope, in trying to find all public funders in a wide range of countries. We drew the line at two and at 200 million because we were specifically looking to identify the 10 largest funders of health research in the world for this research – a goal we thought would be feasible within these limitations. However, like the reviewer, we were worried about the USA. Therefore, we reviewed additional public organizations for the USA. For consistency of reporting, these are not listed in our article, but they are listed on www.healthresearchfunders.org. None besides the two largest public organizations fall in the global top-10. Furthermore, to clarify, we only adhered to this limit for public funders, not for philanthropic funders. Finally, as suggested by the reviewer, we added a section to the supplementary appendix providing more explanation about this.

9. Methods, sub-heading ‘Identification of major philanthropic health research’

Merge this with preceding paragraph. Lots more of text repetition in the methods, think about where you can condense and cut down.

Answer: we have merged this section in the article (and provide more detail in the supplementary, as suggested).

10. Methods, ‘Identification of major ODA-agencies that fund health research. ODA-agencies with major spending on health research were identified by: 1) The world’s top 5 donor countries of Development Assistance for Health (DAH) were identified.’

In the next paragraph, there is ‘1) First, the three largest donor countries of DAH were identified’
Why top 5 in one, and then top 3 in another?

**Answer:** This was not really a ‘top 5’ or ‘top 3’, we did not limit the ODA agencies and multilaterals that we identified. These top 5 and 3 relate to how we search for the major ODA and multilateral funders. For the latter, we looked only at the top 3 ODA funders, because for these countries data were available on how much funding was provided to multilaterals via ODA.

11. Methods, ‘We excluded single disease funders’. ~

Were any single disease funders in the top ten? If so, then need to specify this and justify the exclusion accordingly. If any were in the top ten, then I would suggest they should be included, since they will have great sway on setting funding priorities and impact on what other funders do with their money.

**Answer:** after doing this study initially, we had room to expand our analysis and to include more philanthropic funders, particularly from the US and UK. This is why [www.healthresearchfunders.org](http://www.healthresearchfunders.org) now includes > 250 funding organizations. The largest single-disease philanthropic funder that we have identified, Cancer Research UK, did not end up in the top-10. We now make a note of this in our Methods to make this clear and have also added a more detailed note about this to our Methods supplementary.

12. Methods, generally. Need to add in mention that a) you looked at one financial year of each funder, b) link to table 1, c) explain why the expenditure years are different for each funder

**Answer:** In our research, we have found that the term ‘financial year’ is not very helpful because A) not everyone uses it, and B) the definition of the financial year differs globally. Therefore, we have consistently spoken in our article about ‘annual’ expenditures on health research, we hope that’s acceptable. We have added a sentence to the Methods section noting that data were extracted for the most recent year available.

13. Methods, ‘First, we did not include funding that was provided by ministries to funding agencies for distribution as expenditures by the ministries.’. This sentence, plus the following sentences, is unclear and needs rewriting.

**Answer:** rewritten.

14. Methods, ‘using Gross Domestic Product (GDP) deflators from the International Monetary Fund (IMF) World Economic Outlook Database of April 2014.’ Useful to provide weblink here or add source in the list of references

**Answer:** We added a reference.

15. Methods, ‘Assessing the funding patterns and mechanisms of the ten largest funders of health research After the ten largest funding organizations of health research were identified, data were collected on their funding patterns and mechanisms...’

The first sentence after the sub-heading is essentially repeating the sub-heading itself. First sentence could say ‘data were collected on funding patterns and mechanisms...’
Answer: *we have left this sentence as it was, because we want to avoid confusion that we collected data on a wider set of organizations.*

16. Methods, ‘For each organization, data were collected on four aspects of the funder’s funding patterns and mechanisms: 1) the funding scheme(s) used to distribute funding; 2) the amount of funding allocated to a list of health areas from the Global Burden of Disease study’

But only two aspects listed?

*Answer: This should have read ‘two aspects’. Now amended in both the main text and the supplementary information.*

17. Methods. ‘The manner in which funders reported on these funding schemes differed, so a generic framework was developed to report this in a comparable manner’

Assuming the framework exists as a document/template in some way, can it be made available in supplementary info?

*Answer: the framework is reported, as Table 4! This table constitutes the framework that we developed; filled in with data from funders. We now describe this more specifically in our Discussion.*

18. Methods, ‘Fourth, based on funders’ expenditures via various schemes, we classified funders ‘main funding distribution mechanism’ in two ways. First, as:

- (Largely) intramural
- (Largely) extramural
- Mixed’

I think it’s fine to describe the classification like this, but was there a percentage or cut-off that you used to define an expenditure as largely intra/extramural (e.g. 80%)? If so, then state this. If not, then how did you decide?

*Answer: we added percentages in the supplementary, also for the “(Largely) untargeted/targeted etc” categories. Thank you for the suggestion to explicate this.*

19. Methods, ‘The diseases (and other causes of burden of disease) and subcategories of diseases that had the largest burden of disease within their category were chosen, under the assumption that if data were not available for the diseases with the largest burden, they would likely also not be available for diseases with smaller burdens’

Clumsy sentence, needs rewriting.

*Answer: reformulated, both in the main text and in the supplementary information*

20. Results, ‘Data were collected from 4 November 2013 to 12 August 2014.’

Should be in methods, this is not a result (along with much of the paragraphs following it)

*Answer: moved, together with many of the other Results paragraphs.*
21. Results, funding patterns towards disease, ‘When data were available, it became clear that funding organizations’ funding patterns varied. For instance, while several non-communicable diseases constitute large focal areas for some funders, others spend more on infectious disease research. And while some spend significantly more on cancer research than on cardiovascular disease research, the opposite is the case for other funders.’

Doesn’t read very smoothly. Suggest something like ‘...funding patterns varied, with some funders showing clear preferences for investing in communicable over non-communicable diseases, or focusing on specific disease areas such as cardiovascular or oncology research’.

*Answer: corrected and we provided more detail in line with the Reviewer’s suggestion to describe more of our data in the Results section.*

22. Discussion ‘Such debate is needed all the more because public sector health research funding decisions are not only made on the basis of what research is needed, but are regularly influenced by other factors, such as political interests, advocacy and lobbying.’

Agree, would also add an important point that there are very finite resources for investing in R&D, and thus the priorities need to be made in a pragmatic manner and using the best possible evidence.

*Answer: Added*

23. Discussion, ‘Yet, this mapping shows that these data are often not available.’

Agree on a global scale, but individual countries are starting to get funding bodies together under one secretariat, such as the UKCDS in the UK.

*Answer: we agree; we highlight this in the paragraph that starts with “Funders themselves are increasingly...”*

24. Discussion, limitation paragraph. Suggest ending with a concluding paragraph rather than the limitations section. Also under limitations should be the lack of private sector data.

*Answer: we have added a conclusion and the limitation of private sector data.*

25. Discussion, limitations. ‘We view this study as a small first step towards achieving a more comprehensive mapping, in the form of a publicly accessible global dataset of all public and philanthropic funders and their health research expenditures. To help achieve this goal, we have established www.healthresearchfunders.org’

I’d argue that this website and resource deserves more prominence in the paper (top end of the discussion and maybe even consider including it in the abstract), rather than being buried towards the end of the limitations paragraph. Also, these two sentences aren’t really limitations.

*Answer: We have also moved this up now.*

26. Table 1. ‘Total for funders 11 to 55...’

If funders 42-55 did not provide data, then surely it’s total for funders 11-41? Similarly, the next row would therefore be ‘Total for all 41 funding organizations’ rather than all 55? (May be worth having
a separate table or list somewhere of those that did not provide data and keep table 1 to just those that have numbers)

Answer: we have modified Table 1 to describe the sums more accurately.

Reviewer: Fabio Zicker

Reviewer's report:

Major compulsory revisions:

This is a laborious work of trying to summarize and consolidate a wide range of public and philanthropic funding for health research. The paper has some potential interest to those working in this field, but it is not very useful to the overall global health research community with regard to the contribution for transparency, synchronizing funding efforts and the description of what and how the donors fund, as proposed by the authors. Another point that deserve consideration is what is reported as “health research”, according to the reviewed organizations.

Answer: We are surprised by this comment; so far the responses from health researchers in general have been very positive to this work. The question of who the largest funders of health research are, how they fund (intramurally, extramurally, etc) and what they focus on, in our experience, are issues that are particularly of interest to a broad readership!

It seems the two questions: what they fund (i.e. type of research - basic, applied, R&D, social economic research, priority areas, specific themes, conditions for funding, etc.) or how they decide what to fund? (i.e peer-review of competitive grants in response to calls, direct pro-active funding in selected priority areas, seed or matching funding, funding for partnerships, networks, research funding built into larger development projects, etc.) are not sufficiently answered by the paper.

Answer: We agree that more work is needed in this area, but would argue that our paper answers many of these questions. Our article is a good first step towards developing data of this kind. In terms of what funding organizations fund, we provide a detailed table of what each of the 10 largest funders of health research report in terms of funding in 20 key health areas. In doing so, we have not only found interesting differences between funders (as described in our Results section), but we also show that the public accessibility of these data is severely lacking with many funders. We agree that it would also be of interest to look at other categories, such as basic, applied, HSR etc. However, these categorizations are much less consistently reported by funders, and reporting them according to one, harmonized taxonomy is therefore a much greater challenge. We had planned to include this when we started the research, but upon noting the lack of harmonized data available at funders in this area, we decided to exclude this analysis from our article. In terms of how funders fund, again it was challenging for us to report a highly diverse dataset according to one harmonized taxonomy. We feel that Table 4 provides a lot of new information in this regard, on intramural vs. extramural, and types of extramural grants. Although we concede that more categories can be added to this analysis (e.g. funding to partnerships), this taxonomy was in our view the most detailed achievable, given the highly diverse reporting systems by funders (and the lack of data on more detailed categories with many funding organizations). As an example, with some funders funding for partnerships may be
reported separately, but with others may be included in several other amounts, making it very difficult for us to report on such a category. Therefore, more detailed reporting requires more harmonization by funders in their reporting systems.

By narrowing down the inclusion criteria and excluding some categories of funding, it seems that large proportion of resources and modalities of funding are excluded from the review of the broad health research scenario. From the description of the sources of data available it seems that “health research” funding can be a broad category in the expenditure, commitment or budget reports.

**Answer:** The first comment is incorrect; we have included all funding organizations of health research and all their resources and modalities of funding, apologies for the confusion (see also next point). We have merely excluded block funding from governments to universities, because this would distort the findings of this mapping. This was a choice, but a valid one, for which we provide a clear rationale in the paper, and it is only a small limitation (moreover, others have used the same method). The second comment is correct; we are open to suggestions for how to address this point, but solutions are limited in our view, given that this is the format in which the data consist – most funders only report one of these categories, we cannot convert the data. We feel our article serves an important function by highlighting these kinds of problems with the (lack of) availability of data about health research funding. Finally, we note that the data from the funders in the top-10, who are the most important in our report and on who we collected the most data, are very similar; all data for those funders relate only to health research, all concern actual expenditures or commitments, and for all except one exclude operational costs.

In assessing expenditures the authors expressed their interest in reviewing only funding provided directly to research project or investigator-funding. If this is the case, this should be stated upfront in the paper, and explained how this information could be extracted from the reports. As indicated by the authors several generalizations were made to be able to report data across funders.

**Answer:** we have taken this section out now that we realize it presents a confusing and incorrect message. To avoid any confusion: we have included all funding for health research, not only research project or investigator-funding.

Given the diversity of funding organizations, funding allocation and reporting, and the difficulties in classifying funding according to the criteria proposed, the highlighting of top ten public and philanthropic funders within specific criteria for health research funding does not make much sense. More interesting would be to know the top intramural funders, top extramural funders (or proportions), funders/funding focused on less developed countries, funding on targeted groups of diseases, or funding associated to development programs.

**Answer:** we respectfully disagree with the first point and would argue that it is A) of great interest to know who the largest funders of health research are, and B) that our analysis, notwithstanding the limitations (e.g. that the definition of ‘health research’ varies slightly by funding organization), provides a valid approach to listing funders by size. As in any research project, we made choices regarding the in- and exclusion of data. However, we have carefully weighed each of these and have purposefully described these choices and their rationales in great detail in our paper (now mostly in the Additional File 1), so that our analytical approach is as transparent as possible.
We agree fully with the reviewer’s second point, that it would be very interesting to know the top funders for certain sub-types of funders. Therefore, we have made changes to our Abstract, so that it now reports the top funding organization for several subcategories separately. In addition, we already provide detailed lists for ODA funders and multilateral funders in our article (Tables 2 and 3). To report separate lists for other more detailed categories of public and philanthropic funders was beyond the scope of our data collection (e.g. top funders focused on developing countries), however we feel that we have developed the methodology needed to perform such analyses in the future, and agree that this is a logical next step for our research.

The issue of priority setting is mentioned on a few occasions and was used to justify some exclusions; however, priority setting was not an explicit issue to be addressed by the paper.

Answer: this is correct. We did collect data on funding organizations’ priority setting practices, but concluded after our data collection that the data varied so much per organization that we felt more extensive work was needed to first propose a taxonomy for classifying funders’ priority setting practices. We are currently collaborating with colleagues in other countries to try to develop such a taxonomy. For clarity, we removed mentioning of priority setting in earlier sections of the paper, and now only describe it in our Discussion as a limitation.

There is limited discussion of the findings and tables presented. The discussion is focused on the literature available on the topic and mostly on the limitation of the study. However, a very positive outcome is the establishment of the website www.healthresearchfunders.org, to start building a more comprehensive mapping of health research expenditure.

Answer: thank you, we have now given the development of the website a more prominent place in our paper, amongst others by mentioning it in the abstract (as suggested by the other reviewer) and by bringing it forward in our Discussion.

My recommendation would be to rewrite a succinct paper presenting much less details of the funding, but highlighting the differences between funders with regards to modalities of funding and reporting, focusing on what is needed for improving comparability of reporting which could be achieved with the web site created.

Answer: thank you for this suggestion, as per this suggestion and the comments by the other reviewer, we have now substantially shortened the methodological aspects of our analysis in the article and have appended them instead as an additional document. We have expanded our Results section, to provide more descriptions of the data we collected (as suggested by both reviewers) and have amended and restructured the Discussion to provide a clearer overview of the differences between funders in terms of modalities of funding and what is needed to improve transparency on funding data (including their comparability) in the future.